

REMARKS

Upon entry of this amendment, claim 1 is pending in the application. Claim 1 is an independent claim drawn to an apparatus for processing heavy hydrocarbon feed. Claim 1 has been further amended to further clarify what the Applicant considers to be the invention. The amendments to claim 1 also serve to clarify the distinctions between the inventive subject matter and the prior art references. Applicant submits that the amendments to claim 1 do not add new matter within the meaning of 35 U.S.C. §132.

Claim 1 stands rejected under 35 U.S.C. 103(a) as being obvious over van Klinken (U.S. Patent No. 4,039,429) in view of Friday et al. (U.S. Patent No. 6,183,627); and claim 1 stands rejected under 35 U.S.C. 103(a) as being obvious over van Klinken in view of Friday et al., and further in view of Bigeard et al. (U.S. Patent No. 6,153,087).

With entry of the above amendments and the following remarks, Applicant respectfully submits that the pending claims in the application are in condition for allowance. Applicant respectfully requests acknowledgment thereof.

Rejection of Claim 1 under U.S.C. 103(a)

Claim 1 stands rejected under 35 U.S.C. 103(a) as being

obvious over van Klinken et al. (U.S. Patent No. 4,039,429) in view of Friday et al. (U.S. Patent No. 6,183,627) for the reasons set forth in the Office Action.

RESPONSE

Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

The references of record, van Klinken et al. and Friday et al., do not teach or suggest applicants' inventive subject matter as a whole, as recited in the amended claims. Further, there is no teaching or suggestion in the references which would lead the ordinary skilled artisan to modify them to derive the subject matter as defined in the amended claims.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of nonobviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and

(3) that the prior art references teach or suggest all the claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

A. The Present Inventive Subject Matter

As amended, claim 1 is drawn to an apparatus for processing heavy hydrocarbon feed. The apparatus comprises many components, including a heater for heating said heavy hydrocarbon feed, an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms and a further heater for heating the atmospheric bottoms and producing heated atmospheric bottoms. The apparatus also comprises a vacuum fractionating tower for fractionating the heated atmospheric bottoms and producing light vacuum fractions and vacuum

residue, and a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from the vacuum residue. The apparatus further comprises a deasphalted oil thermal cracker for thermally cracking the deasphalted oil (DAO) and producing thermally cracked deasphalted oil, a thermally cracked deasphalted oil connector connecting an outlet of the deasphalted oil thermal cracker to an inlet of the atmospheric fractionating tower by way of a line so that only the thermally cracked deasphalted oil is recycled to the inlet of said atmospheric fractionating tower by way of the line, and a light vacuum fraction thermal cracker for thermally cracking the light vacuum fractions for producing thermally cracked light vacuum fractions, a thermally cracked light vacuum fractions connector connecting an outlet of the light vacuum fraction thermal cracker to an inlet of the atmospheric fractionating tower by way of a line so that only the thermally cracked light vacuum fractions is recycled to the inlet of the atmospheric fractionating tower by way of the line.

B. The Prior Art

Van Klinken (U.S. Patent No. 4,039,429) discloses a combination of processes that are designed to convert atmospheric reduced crude to light products through conversion by Fluid Catalytic Cracking (FCC). Van Klinken discloses several

combinations of vacuum distillation, visbreaking, deasphalting and FCC to obtain light products.

Friday et al. (U.S. Patent No. 6,183,627) discloses upgrading of a dirty hydrocarbon feed involving applying the feed to a distillation column for producing a substantially asphaltene-free and metal-free distillate fraction and a non-distilled fraction containing sulfur, asphaltenes, and metals. At least some of the substantially asphaltene-free and metal-free distillate fraction is converted to a hydrogen donor diluent. The non-distilled fraction is processed in a solvent deasphalting unit for producing a deasphalted oil stream and an asphaltene stream. After a combined stream is formed from the hydrogen donor diluent and the deasphalted oil stream, the combined stream is thermally cracked forming a thermally cracked stream that is applied to the distillation column.

C. Differences between the Claimed Subject Matter
and the Prior Art

The differences between applicant's inventive subject matter and the cited reference are readily apparent from their independent and distinct disclosures. The differences between the presently claimed subject matter and van Klinken have been stated in previous responses and will only be summarized here for brevity's sake.

Applicant respectfully submits that the present inventive subject matter involves two different thermal crackers: a deasphalted oil thermal cracker and a light vacuum fractions thermal cracker. Claim 1 clearly emphasizes this point. In addition, the present inventive subject matter is directed to a combined distillation/SDA/thermal cracking system **that recycles the thermally cracked products to the distillation/SDA system.** The recycle of the thermally cracked product allows the system to reject the very heavy insolubles, thus making it possible to extend the conversion range.

Applicant respectfully reiterates that van Klinken **does not** disclose the recycle of the **thermally cracked products to the atmospheric distillation column**, since van Klinken et al. disclose **catalytic cracking**, not thermal cracking. In addition, Applicant respectfully submits that there is no motivation or teaching to recycle the van Klinken **catalytically cracked** product because the catalytic cracking employed **consumes any heavy materials produced therein** by the catalyst. In other words, if properly used, the van Klinken process **will not produce many heavy materials** because the catalyst present in the cracker **will prevent that from happening.** In fact, the main reason that the catalyst is included in the cracker is exactly to prevent the production of many heavy

materials. Thus, with no heavy materials present, there is no reason to modify the van Klinken in an attempt to achieve the present subject matter.

Turning now to Friday et al., Applicants respectfully submit that this patent is no longer a valid reference against the present application. The Friday et al. patent was issued on February 6, 2001, which is after the filing date of the present application. Thus, in order to use the Friday et al. patent as prior art, the Examiner must be relying on 35 U.S.C. 102(e) which says that a U.S. patent is prior art as of its filing date. In that case, the Friday et al. would be considered prior art.

However, Applicant would like to draw the Examiner's attention to 35 U.S.C. 103(c), which says that subject matter developed by another person (true in this case as the inventorship is different between the Friday et al. patent and the instant application) which qualifies as prior art **only** under one or more of 35 U.S.C. 102(e), (f) or (g) shall not preclude patentability under section 103 of 35 U.S.C. where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. Applicant respectfully submits that the Examiner is relying on 35 U.S.C. 102(e) to bring the Friday et al. patent in as prior art.

Applicant has reviewed the files for this application.

Applicant notes that, at the time of the invention, the Friday et al. patent was already assigned to ORMAT INDUSTRIES LTD. In addition, the present inventor was an employee of ORMAT INDUSTRIES LTD. at the time of invention and had signed a document stating that he was under an obligation to assign all inventions and patent applications to ORMAT INDUSTRIES LTD. **Thus, the application and the reference were, at the time the invention was made, owned by, or subject to an obligation of assignment to the same party, namely, ORMAT INDUSTRIES LTD.** Therefore, Applicant respectfully submits that the post-AIPA 35 U.S.C. 103(c) controls in this case, and thus, the Friday et al. patent is not proper prior art to be relied on in rejecting the instant claims.

Since the Friday et al. patent is not valid prior art against the instant claims, the Examiner has failed to make a *prima facie* case of obviousness against claim 1, especially since van Klinken is deficient in disclosing all of the claimed elements of claim 1 and the Examiner was relying on Friday et al. to supply missing elements.

Accordingly, Applicants respectfully submit that claim 1 is not obvious over the prior art and respectfully request reconsideration and withdrawal of this rejection.

Rejection of Claim 1 Under 35 U.S.C. 103(a)

Claim 1 stands rejected under 35 U.S.C. 103(a) as being obvious over van Dongen et al. (U.S. Patent No. 4,405,441) in view of van Klinken et al. (U.S. Patent No. 4,039,429) for the reasons set forth in the Office Action.

RESPONSE

Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

The references of record, van Dongen et al. and van Klinken et al., do not teach or suggest applicants' inventive subject matter as a whole, as recited in the amended claims. Further, there is no teaching or suggestion in the references which would lead the ordinary skilled artisan to modify them to derive the subject matter as defined in the amended claims.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of nonobviousness.

To establish a *prima facie* case of obviousness, the Examiner

must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

A. The Present Inventive Subject Matter

As indicated above, amended claim 1 is drawn to an apparatus for processing heavy hydrocarbon feed. The apparatus comprises many components, including a heater for heating said heavy hydrocarbon feed, an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms and a further heater for heating the atmospheric bottoms and producing heated atmospheric bottoms.

The apparatus also comprises a vacuum fractionating tower for fractionating the heated atmospheric bottoms and producing light vacuum fractions and vacuum residue, and a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from the vacuum residue. The apparatus further comprises a deasphalted oil thermal cracker for thermally cracking the deasphalted oil (DAO) and producing thermally cracked deasphalted oil, a thermally cracked deasphalted oil connector connecting an outlet of the deasphalted oil thermal cracker to an inlet of the atmospheric fractionating tower by way of a line so that only the thermally cracked deasphalted oil is recycled to the inlet of said atmospheric fractionating tower by way of the line, and a light vacuum fraction thermal cracker for thermally cracking the light vacuum fractions for producing thermally cracked light vacuum fractions, a thermally cracked light vacuum fractions connector connecting an outlet of the light vacuum fraction thermal cracker to an inlet of the atmospheric fractionating tower by way of a line so that only the thermally cracked light vacuum fractions is recycled to the inlet of the atmospheric fractionating tower by way of the line.

B. The Prior Art

Van Dongen (U.S. Patent No. 4,405,441) discloses a process for

the preparation of hydrocarbon oil distillates. The distillates are prepared from asphaltene-rich feeds by a process comprising subjecting the feed to catalytic hydroconversion, and subjecting the distillation residue of the hydroconverted product to a combination of solvent deasphalting and thermal cracking.

In addition, van Klinken (U.S. Patent No. 4,039,429) discloses a combination of processes that are designed to convert atmospheric reduced crude to light products through conversion by Fluid Catalytic Cracking (FCC). Van Klinken discloses several combinations of vacuum distillation, visbreaking, deasphalting and FCC to obtain light products.

C. Differences between the Claimed Subject Matter
and the Prior Art

The differences between applicant's inventive subject matter and the cited reference are readily apparent from their independent and distinct disclosures. As is claimed in amended claim 1, the present inventive subject matter is directed to an apparatus that includes the **total** recycle of the thermally cracked deasphalted oil and the thermally cracked light vacuum fractions. The recycle of these streams is to the inlet of the **original** atmospheric fractionating tower, thus resulting in the **total** conversion of the deasphalted oil and light vacuum fractions. By this arrangement of

the presently claimed apparatus, substantially all of the insoluble material (i.e., the asphaltenes), both in the original feed and that which is produced by the thermal processes, is rejected in the asphaltene stream.

*total recycle
not claimed
"comparing"*

On the other hand, van Dongen et al. teach that only **some** of the cracked material is recycled. As is clearly seen in the van Dongen patent, the patent discloses that hydrotreating the hydrocarbon feed prior to distillation or extraction of thermal cracking is carried out. Applicant respectfully submits that his requires a wholly different apparatus than that which is claimed in claim 1.

Furthermore, the present claim requires that the thermally cracked deasphalted oil, besides being totally recycled, is recycled in a dedicated line. Amendments to the claims make this distinction abundantly clear, as do the figures. This is also true for the recycled thermally cracked light vacuum fractions. In other words, both the thermally cracked deasphalted oil and the thermally cracked light vacuum fractions are recycled to the **original** atmospheric fractionation column in respectively dedicated lines, allowing 100% of the thermally cracked products to be recycled.

*new matter
not really
claimed*

As is apparent from the figures in the present application and the respective references, by having the total amount of thermally

cracked products (deasphalted oil and light vacuum fractions) recycled in separate dedicated lines, Applicant has been able to greatly simplify the process over the cited prior art. Such a simplification of the process is neither taught, nor suggested, by either of the cited references, as neither reference discloses or suggests recycling the total amount of thermally cracked product in dedicated lines.

Since neither reference suggests or teaches the above limitations, Applicant respectfully submits that the combination thereof would also be deficient with respect to those limitations. Assuming, *arguendo*, that the references were combined in an attempt to achieve the presently claimed subject matter, Applicant respectfully submits that such a combination would still not teach every claimed limitation, as is required in order to prove a *prima facie* case of obviousness. In particular, the combination of references would still lack the above limitations of recycling all of the thermally cracked products in dedicated lines.

Thus, Applicant respectfully submits that the Examiner has failed to prove a *prima facie* case of obviousness since the combination of references would fail to teach every claimed limitation. As such, Applicant respectfully submits that the claims are not obvious over the references, and respectfully requests reconsideration and withdrawal of the rejection.

CONCLUSION

In view of the foregoing, applicants respectfully request the Examiner to reconsider and withdraw the all pending rejections, and to allow all of the claims pending in this application.

If the Examiner has any questions or comments regarding this matter, he is welcomed to contact the undersigned attorney at the below-listed number and address.

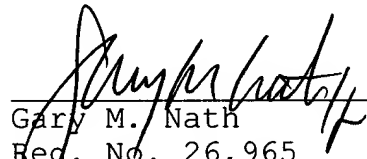
Respectfully submitted,

NATH & ASSOCIATES

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NATH & ASSOCIATES

1030 Fifteenth Street, N.W.
Sixth Floor
Washington, D.C. 20005
Tel: (202) 775-8383
Fax: (202) 775-8396
GMN:JLM:sv/roa4.wpd



Gary M. Nath
Reg. No. 26,965
Jerald L. Meyer
Reg. No. 41,194
Customer No. 20529

Serial No.: 09/431,159

Group Art Unit: 1764

Filed: November 1, 1999

Examiner: R. Varcoe Jr.

For: **METHOD OF AND APPARATUS FOR PROCESSING HEAVY
HYDROCARBON FEEDS**

ATTACHMENT A - MARKED-UP COPY OF CLAIM AMENDMENTS

Please amend claim 1 as follows:

1. (Four-times Amended) Apparatus of processing heavy hydrocarbon feed comprising:

- a) a heater for heating said heavy hydrocarbon feed;
- b) an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms;
- c) a further heater for heating said atmospheric bottoms and producing heated atmospheric bottoms;
- d) a vacuum fractionating tower for fractionating said heated atmospheric bottoms and producing light vacuum fractions and vacuum residue;
- e) a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from said vacuum residue;
- f) a deasphalted oil thermal cracker for thermally cracking said deasphalted oil (DAO) and producing thermally cracked deasphalted oil, a thermally cracked deasphalted oil connector connecting an outlet of said deasphalted oil thermal cracker to an inlet of said atmospheric fractionating tower by way of a line so that only said thermally cracked deasphalted oil is recycled to the inlet of said atmospheric fractionating tower by way of said line; and
- g) a light vacuum fraction thermal cracker for thermally cracking said light vacuum fractions for producing thermally cracked light vacuum fractions, a thermally cracked

light vacuum fractions connector connecting an outlet of said light vacuum fraction thermal cracker to an inlet of said atmospheric fractionating tower by way of a line so that only said thermally cracked light vacuum fractions is recycled to the inlet of said atmospheric fractionating tower by way of said line.

Serial No.: 09/431,159

Group Art Unit: 1764

Filed: November 1, 1999

Examiner: R. Varcoe Jr.

For: **METHOD OF AND APPARATUS FOR PROCESSING HEAVY
HYDROCARBON FEEDS**

ATTACHMENT B - CLEAN COPY OF AMENDED CLAIMS

Please amend claim 1 as follows:

1. (Four-times Amended) Apparatus of processing heavy hydrocarbon feed comprising:

- a) a heater for heating said heavy hydrocarbon feed;
- b) an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms;
- c) a further heater for heating said atmospheric bottoms and producing heated atmospheric bottoms;
- d) a vacuum fractionating tower for fractionating said heated atmospheric bottoms and producing light vacuum fractions and vacuum residue;
- e) a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from said vacuum residue;
- f) a deasphalted oil thermal cracker for thermally cracking said deasphalted oil (DAO) and producing thermally cracked deasphalted oil, a thermally cracked deasphalted oil connector connecting an outlet of said deasphalted oil thermal cracker to an inlet of said atmospheric fractionating tower by way of a line so that only said thermally cracked deasphalted oil is recycled to the inlet of said atmospheric fractionating tower by way of said line; and
- g) a light vacuum fraction thermal cracker for thermally cracking said light vacuum fractions for producing thermally cracked light vacuum fractions, a thermally cracked

light vacuum fractions connector connecting an outlet of said light vacuum fraction thermal cracker to an inlet of said atmospheric fractionating tower by way of a line so that only said thermally cracked light vacuum fractions is recycled to the inlet of said atmospheric fractionating tower by way of said line.
